C++

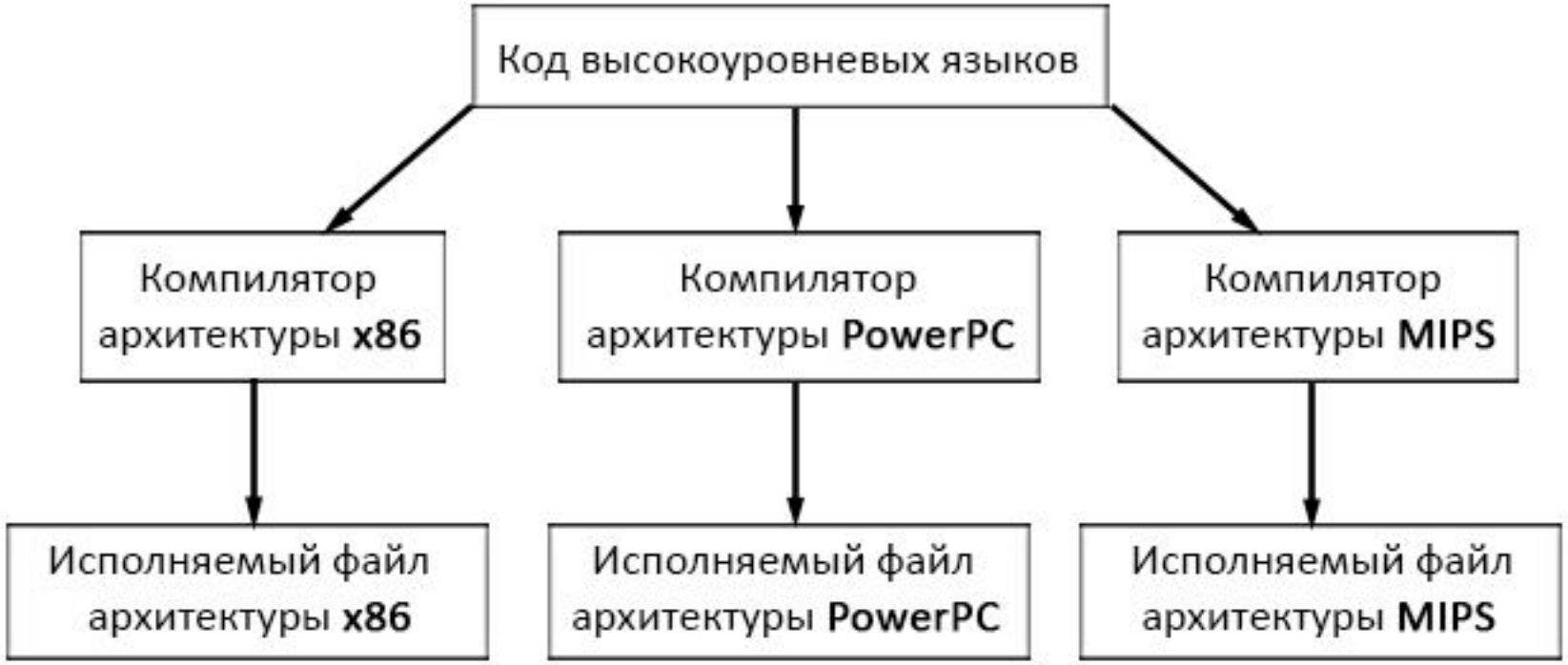
01_

Компилятор

- **Компилятор** – это программа, которая читает код и создает автономную (способную работать независимо от другого аппаратного или программного обеспечения) исполняемую программу, которую процессор понимает напрямую. При запуске программы весь код компилируется целиком, создается исполняемый файл и при повторном запуске компилятор уже не нужен.

Интерпретатор

- **Интерпретатор** — это программа, которая сразу выполняет код, без предыдущего создания исполняемого файла. Код интерпретируется построчно и сразу выполняется, в отличии от компиляции, где сначала целиком компилируется весь код, а затем уже выполняется. Интерпретаторы более гибкие, так как подходят под любые платформы, где есть интерпретатор, но менее эффективны при выполнении программы, потому что процесс интерпретации должен быть при каждом запуске программы. В отличии от компиляции, каждый раз, когда вы запускаете программу интерпретатор по новой выполняет весь процесс.


Код высокоуровневых языков
Компилятор архитектуры **x86**
Компилятор архитектуры **PowerPC**
Компилятор архитектуры **MIPS**
Исполняемый файл архитектуры **x86**
Исполняемый файл архитектуры **PowerPC**
Исполняемый файл архитектуры **MIPS**

История

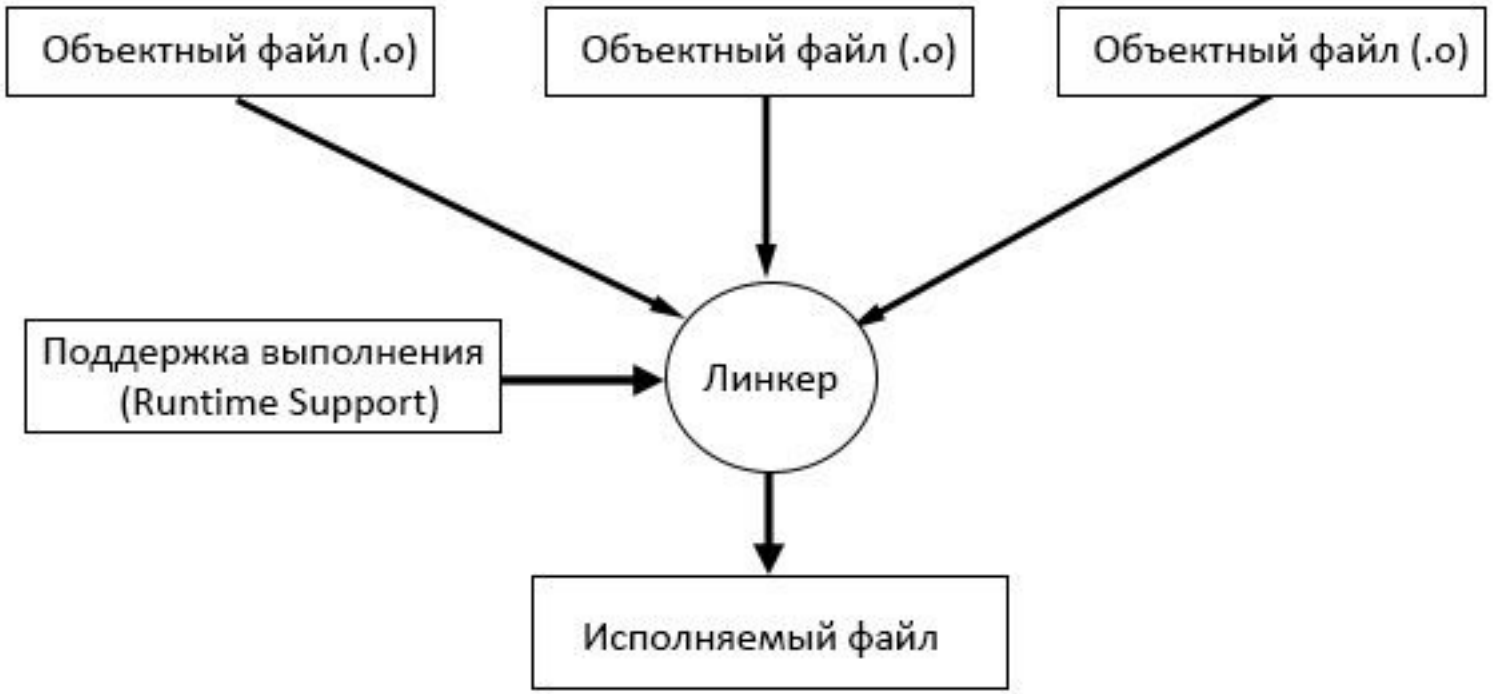
- **1972 C** Деннис Ритчи в *Bell Telephone Laboratories*
- **1978** Брайан Керниган и Деннис Ритчи *«Язык программирования Си». «K&R»*
- **1983** году Американский национальный институт стандартов (**ANSI**) стандарт C
- **1989** году они выпустили стандарт C89, более широко известен как ANSI
- **1990** Международная организация по стандартизации (**ISO**) приняла ANSI C - C90
- **1999** ANSI C99
- **1979 C++** Бьёрн Страуструп в *Bell Labs* в качестве дополнения к C
- **1998** C++ ратифицированным ISO
- **2003** C++ 03
- **2011** C++ 11
- **2014** C++ 14


Шаг 1: Определите проблему
Шаг 2: Разработайте решение
Шаг 3: Напишите программу, используя решение
Шаг 4: Скомпилируйте программу
Шаг 5: Соедините объектные файлы
Шаг 6: Протестируйте и отладьте программу

Компиляция


Исходный файл (.cpp)
Компиляция
Объектный файл (.o)
Исходный файл (.cpp)
Компиляция
Объектный файл (.o)
Исходный файл (.cpp)
Компиляция
Объектный файл (.o)

Линкинг

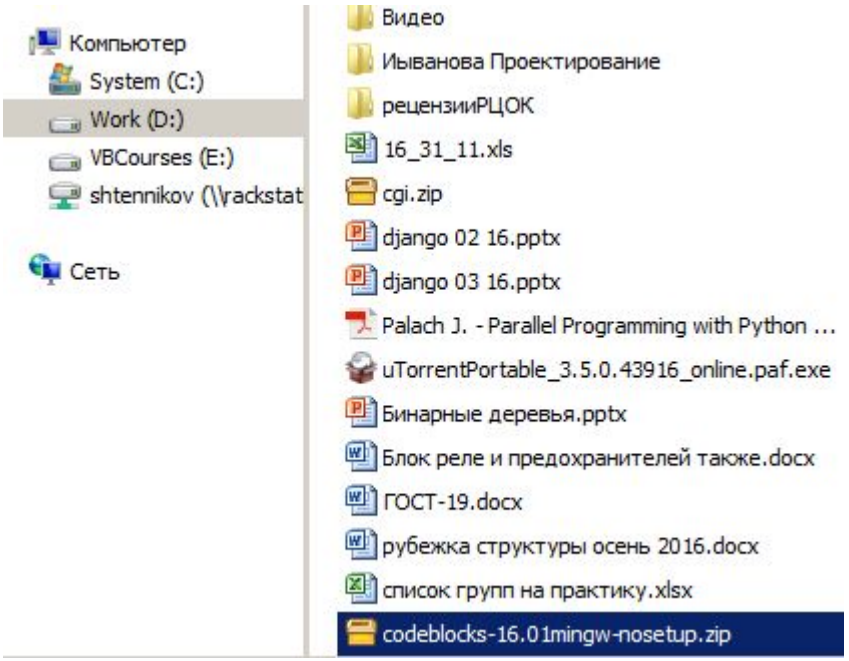

Объектный файл (.o)
Объектный файл (.o)
Объектный файл (.o)
Поддержка выполнения
(Runtime Support)
Линкер
Исполняемый файл

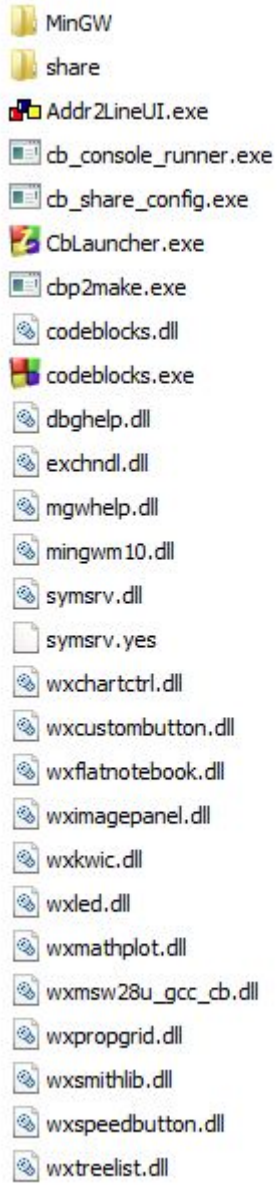
- Dev C++
- Sublime
- Code Blocks
- Visual Studio

http://www.codeblocks.org/

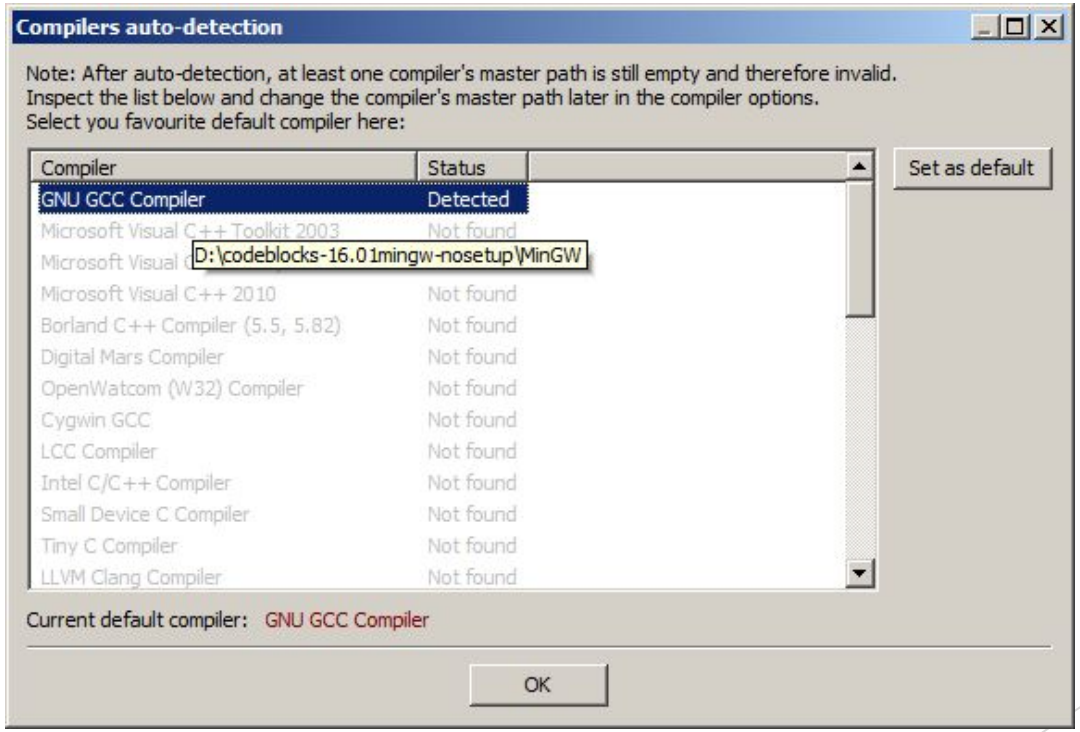
Windows XP / Vista / 7 / 8.x / 10:

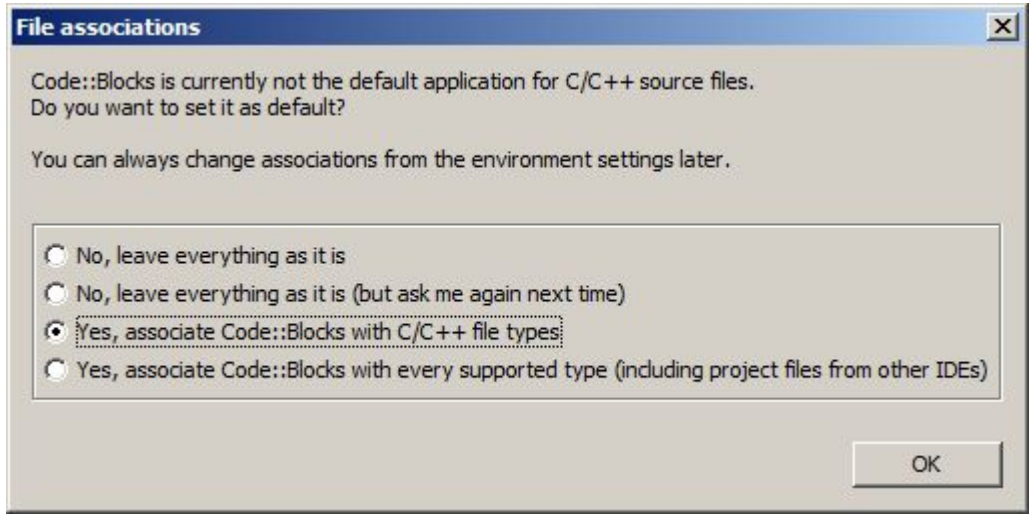
File
codeblocks-16.01-setup.exe
codeblocks-16.01-setup-nonadmin.exe
codeblocks-16.01-nosetup.zip
codeblocks-16.01mingw-setup.exe
codeblocks-16.01mingw-nosetup.zip
codeblocks-16.01mingw_fortran-setup.exe

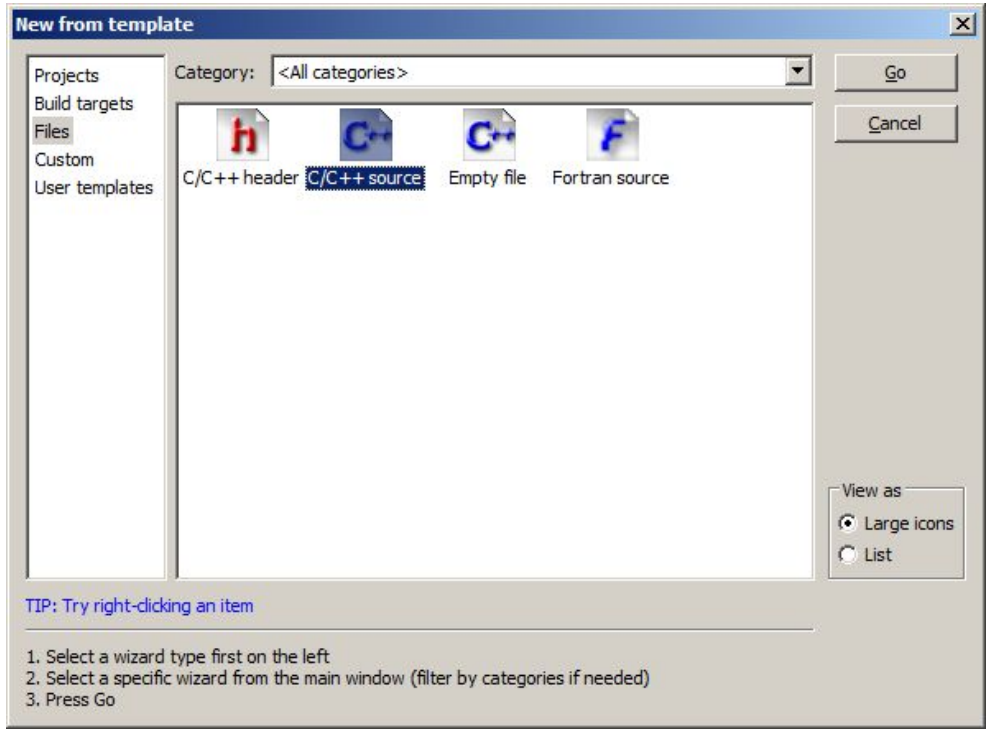

Компьютер
System (C:)
Work (D:)
VBCourses (E:)
shtennikov (\\rackstat
Сеть
Видео
Иыванова Проектирование
рецензииРЦОК
16_31_11.xls
cgi.zip
django 02 16.pptx
django 03 16.pptx
Palach J. - Parallel Programming with Python ...
uTorrentPortable_3.5.0.43916_online.paf.exe
Бинарные деревья.pptx
Блок реле и предохранителей также.docx
ГОСТ-19.docx
рубежка структуры осень 2016.docx
список групп на практику.xlsx
codeblocks-16.01mingw-nosetup.zip

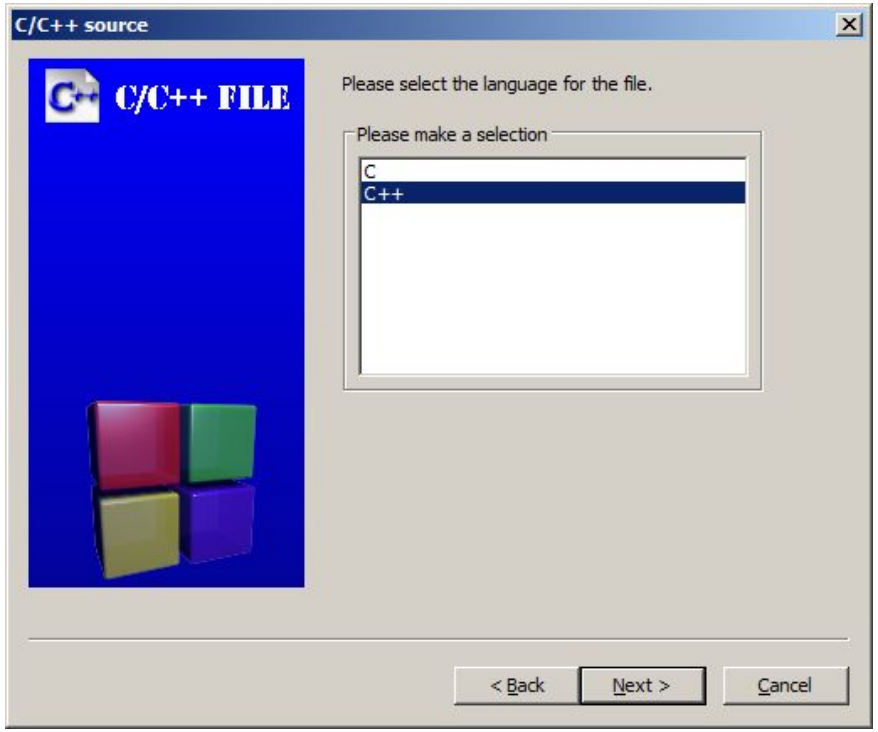

MinGW
share
Addr2LineUI.exe
cb_console_runner.exe
cb_share_config.exe
CbLauncher.exe
cbp2make.exe
codeblocks.dll
codeblocks.exe
dbghelp.dll
exchndl.dll
mgwhelp.dll
mingwm10.dll
symsrv.dll
symsrv.yes
wxchartctrl.dll
wxcustombutton.dll
wxflatnotebook.dll
wximagepanel.dll
wxkwic.dll
wxled.dll
wxmathplot.dll
wxmsw28u_gcc_cb.dll
wxpropgrid.dll
wxsmithlib.dll
wxspeedbutton.dll
wxtreelist.dll

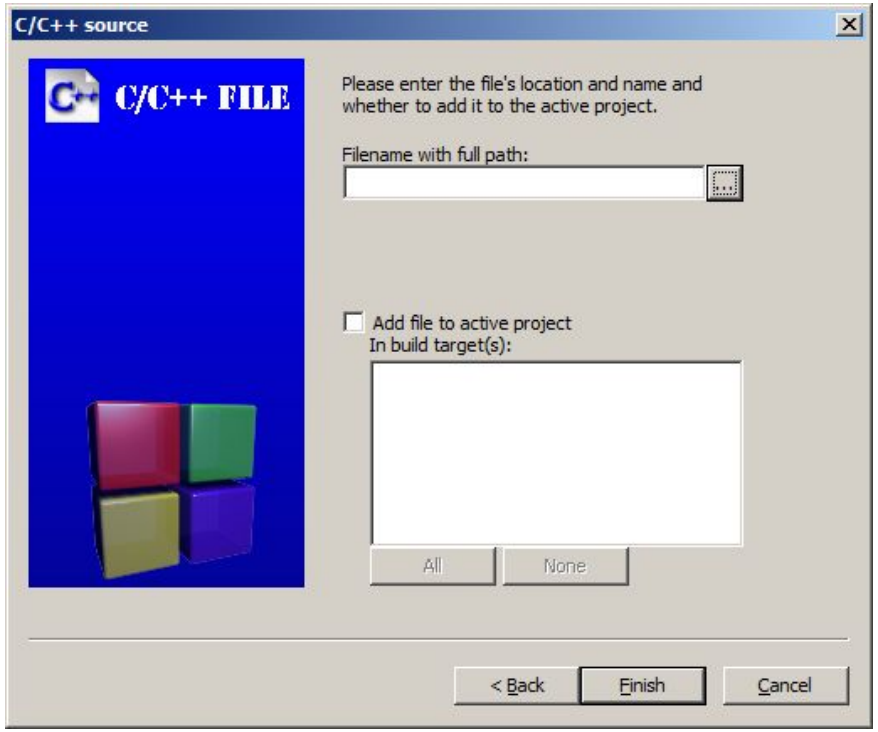
Выбор компилятора

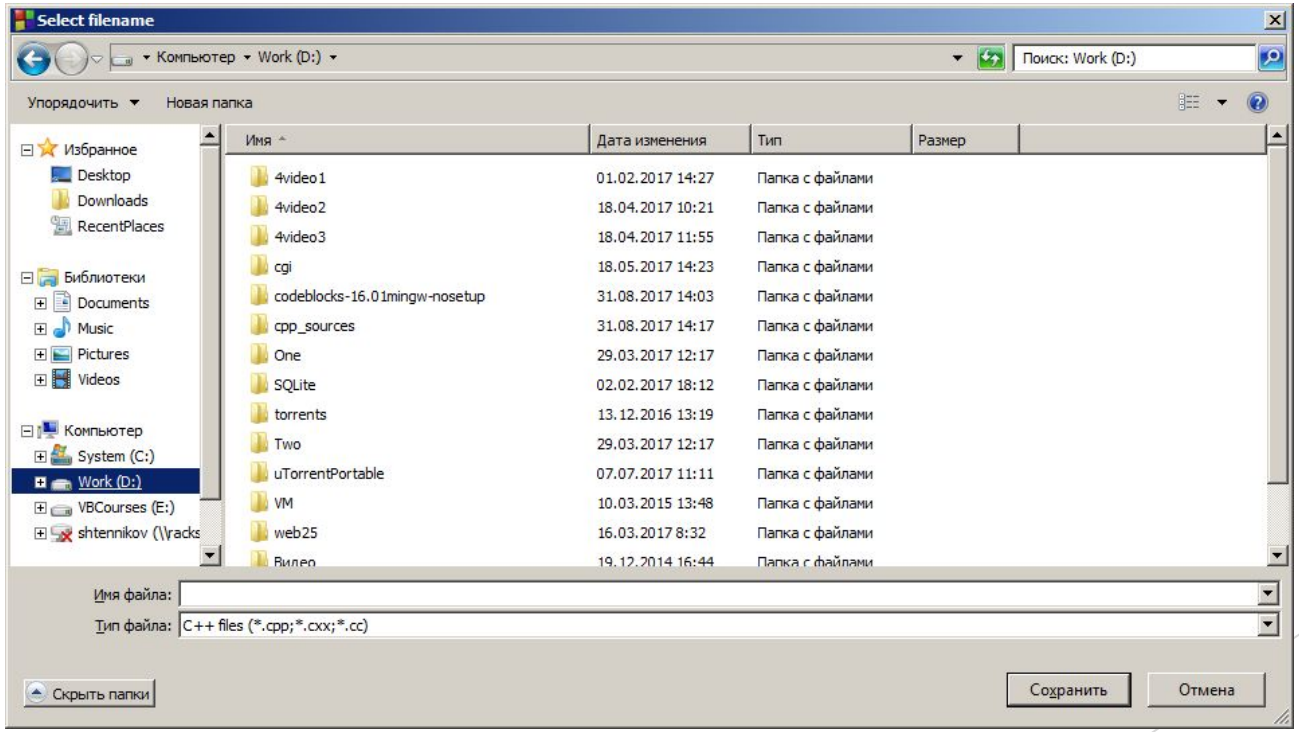


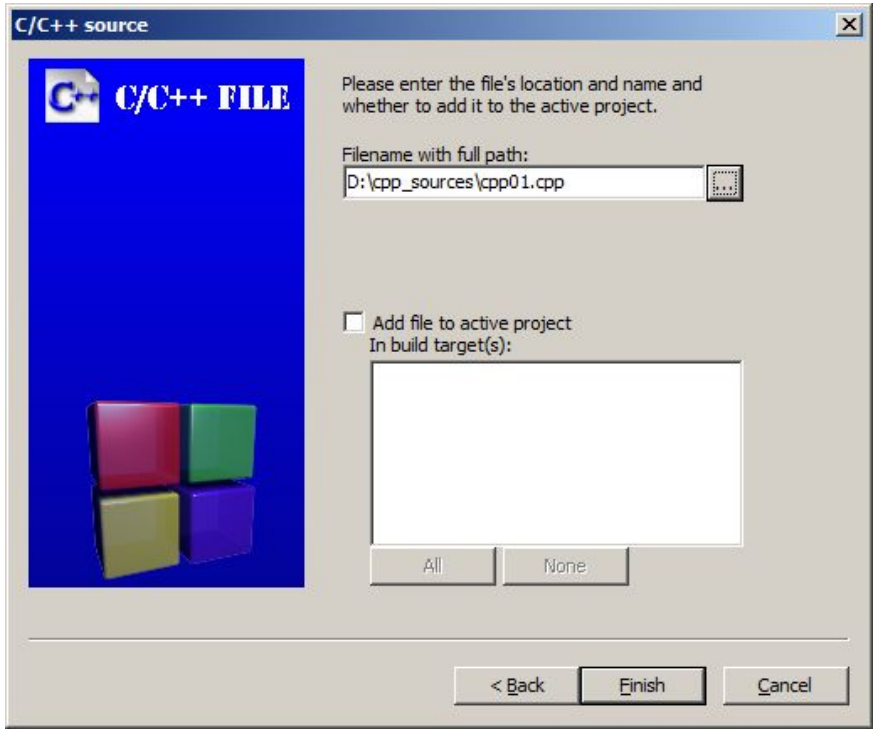

File associations
Code::Blocks is currently not the default application for C/C++ source files.
Do you want to set it as default?
You can always change associations from the environment settings later.
No, leave everything as it is
No, leave everything as it is (but ask me again next time)
Yes, associate Code::Blocks with C/C++ file types
Yes, associate Code::Blocks with every supported type (including project files from other IDEs)
OK


New from template
Projects
Build targets
Files
Custom
User templates
Category:
<All categories>
Go
Cancel
C/C++ header
C/C++ source
Empty file
Fortran source
View as
Large icons
List
TIP: Try right-clicking an item
1. Select a wizard type first on the left
2. Select a specific wizard from the main window (filter by categories if needed)
3. Press Go

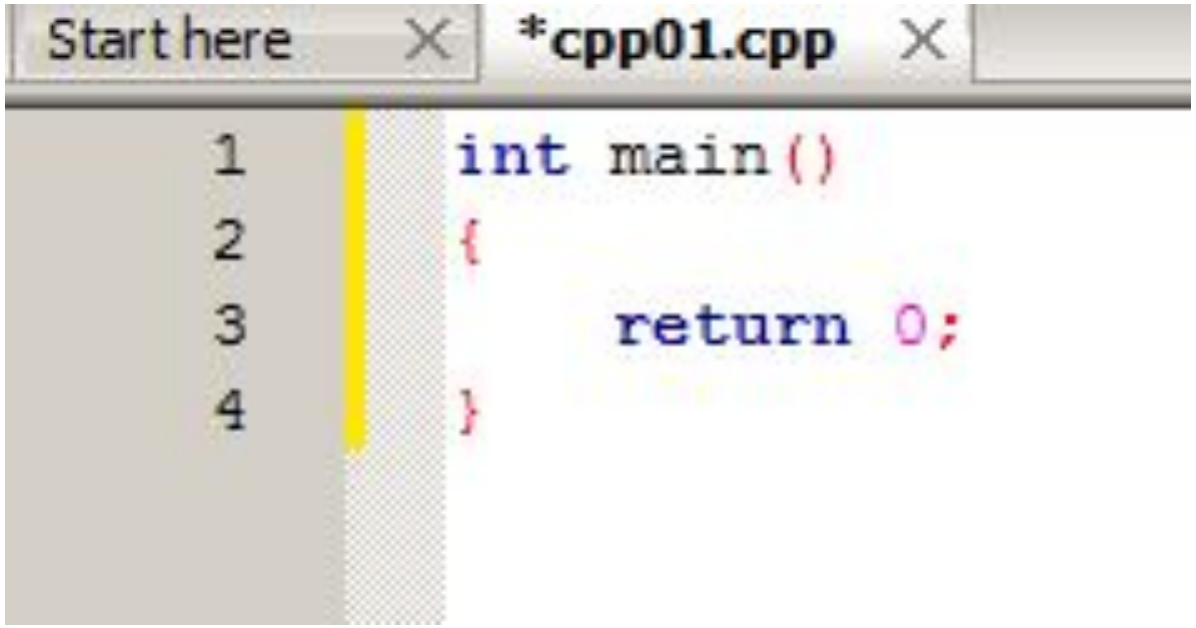

C/C++ source
C/C++ FILE
Please select the language for the file.
Please make a selection
C
C++
< Back
Next >
Cancel

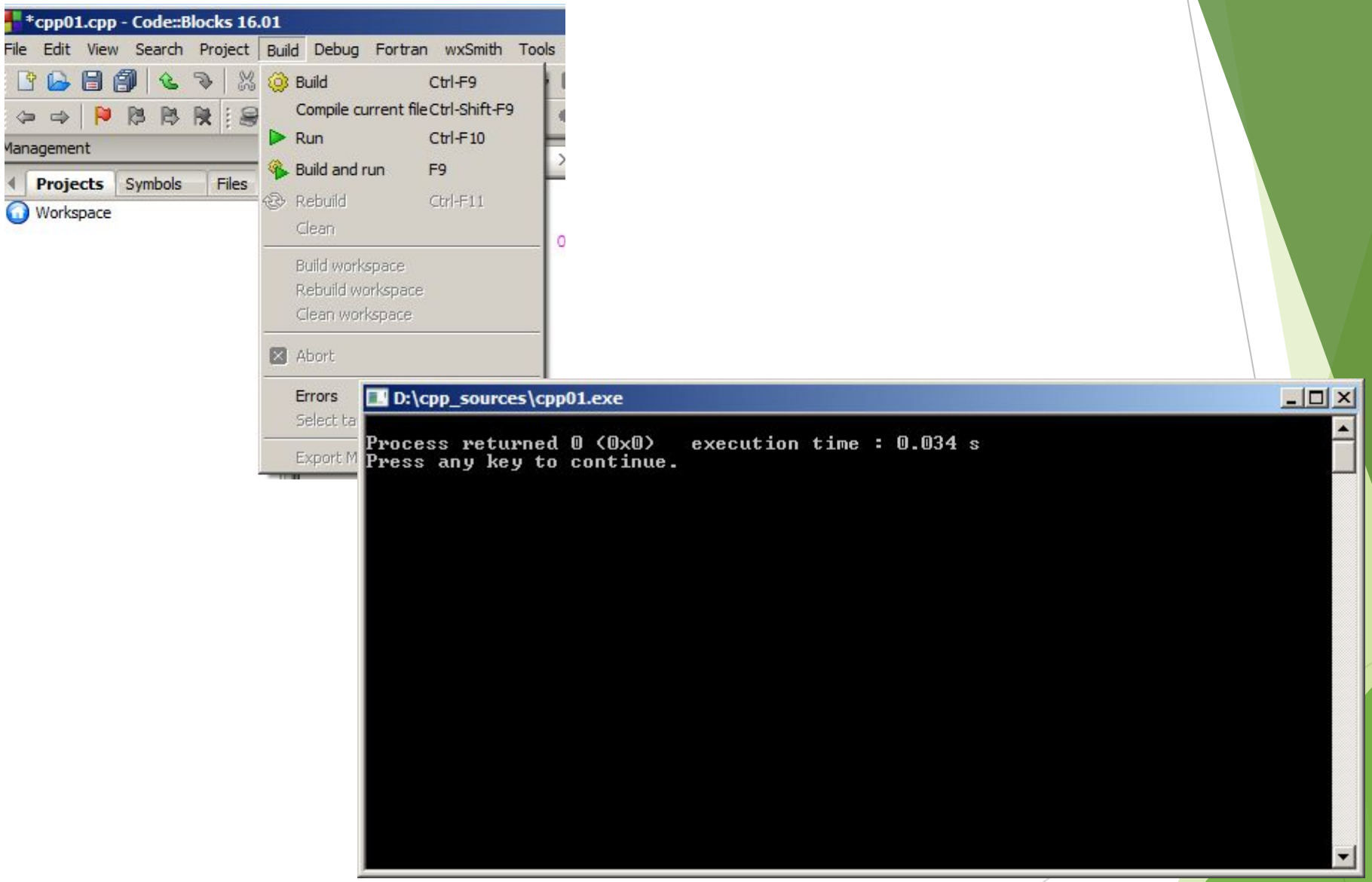

C/C++ source
C/C++ FILE
Please enter the file's location and name and whether to add it to the active project.
Filename with full path:
Add file to active project
In build target(s):
All
None
< Back
Finish
Cancel

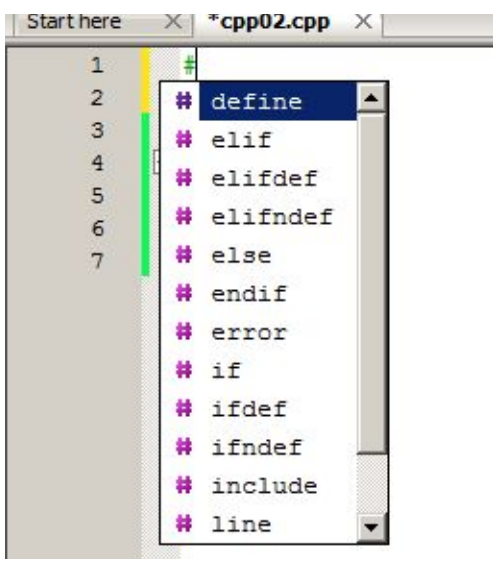

Select filename
Компьютер ▸ Work (D:) ▸
Поиск: Work (D:)
Упорядочить
Новая папка
Избранное
Desktop
Downloads
RecentPlaces
Библиотеки
Documents
Music
Pictures
Videos
Компьютер
System (C:)
Work (D:)
VBCourses (E:)
shtennikov (\\racks
Имя
Дата изменения
Тип
Размер
4video1 01.02.2017 14:27 Папка с файлами
4video2 18.04.2017 10:21 Папка с файлами
4video3 18.04.2017 11:55 Папка с файлами
cgi 18.05.2017 14:23 Папка с файлами
codeblocks-16.01mingw-nosetup 31.08.2017 14:03 Папка с файлами
cpp_sources 31.08.2017 14:17 Папка с файлами
One 29.03.2017 12:17 Папка с файлами
SQLite 02.02.2017 18:12 Папка с файлами
torrents 13.12.2016 13:19 Папка с файлами
Two 29.03.2017 12:17 Папка с файлами
uTorrentPortable 07.07.2017 11:11 Папка с файлами
VM 10.03.2015 13:48 Папка с файлами
web25 16.03.2017 8:32 Папка с файлами
Видео 19.12.2014 16:44 Папка с файлами
Имя файла:
Тип файла:
C++ files (*.cpp;*.cxx;*.cc)
Скрыть папки
Сохранить
Отмена

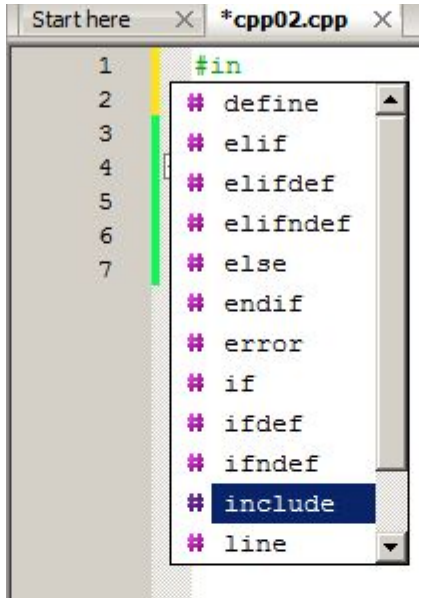

C/C++ source
C/C++ FILE
Please enter the file's location and name and whether to add it to the active project.
Filename with full path:
D:\cpp_sources\cpp01.cpp
Add file to active project
In build target(s):
All
None
< Back
Finish
Cancel

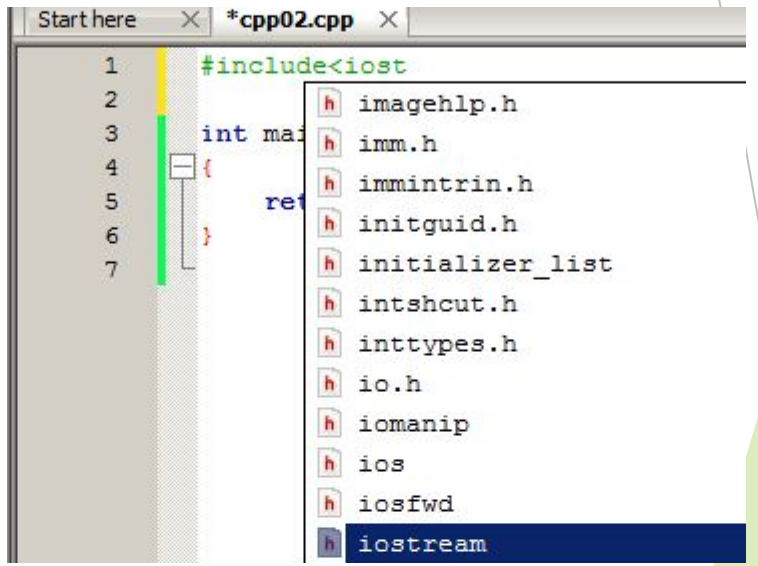
Первая программа




*cpp01.cpp - Code::Blocks 16.01
File Edit View Search Project Build Debug Fortran wxSmith Tools
Build Ctrl-F9
Compile current file Ctrl-Shift-F9
Run Ctrl-F10
Build and run F9
Rebuild Ctrl-F11
Clean
Build workspace
Rebuild workspace
Clean workspace
Abort
Errors
Projects Symbols Files
Workspace
D:\cpp_sources\cpp01.exe
Process returned 0 (0x0) execution time : 0.034 s
Press any key to continue.


Start here
*cpp02.cpp
1
2
3
4
5
6
7
#
define
elif
elifdef
elifndef
else
endif
error
if
ifdef
ifndef
include
line

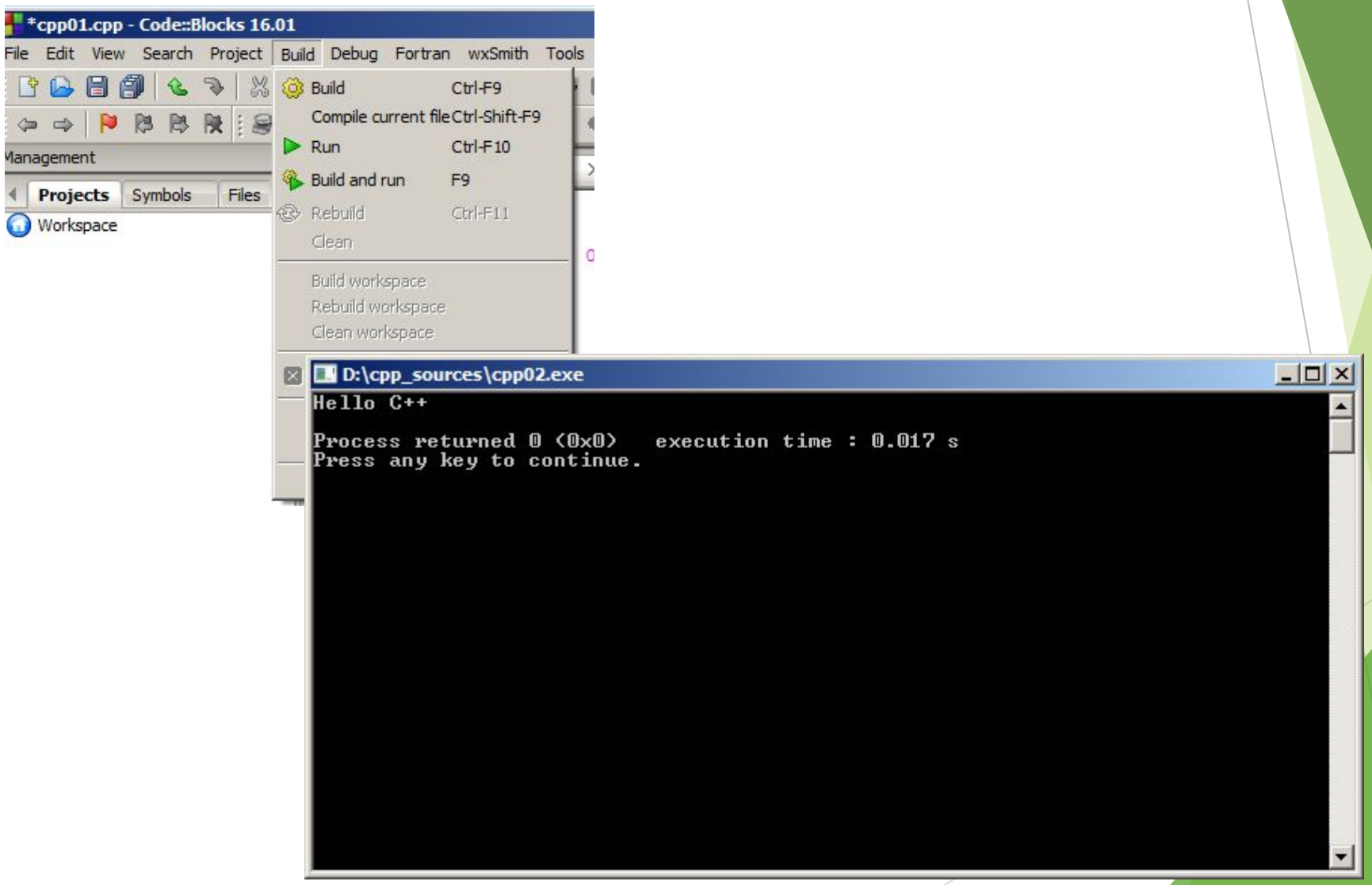

Start here
*cpp02.cpp
1
2
3
4
5
6
7
#in
define
elif
elifdef
elifndef
else
endif
error
if
ifdef
ifndef
include
line


Start here
*cpp02.cpp
1
2
3
4
5
6
7
#include<iost
int mai
{
ret
}
imagehlp.h
imm.h
immintrin.h
initguid.h
initializer_list
intshcut.h
inttypes.h
io.h
iomanip
ios
iosfwd
iostream

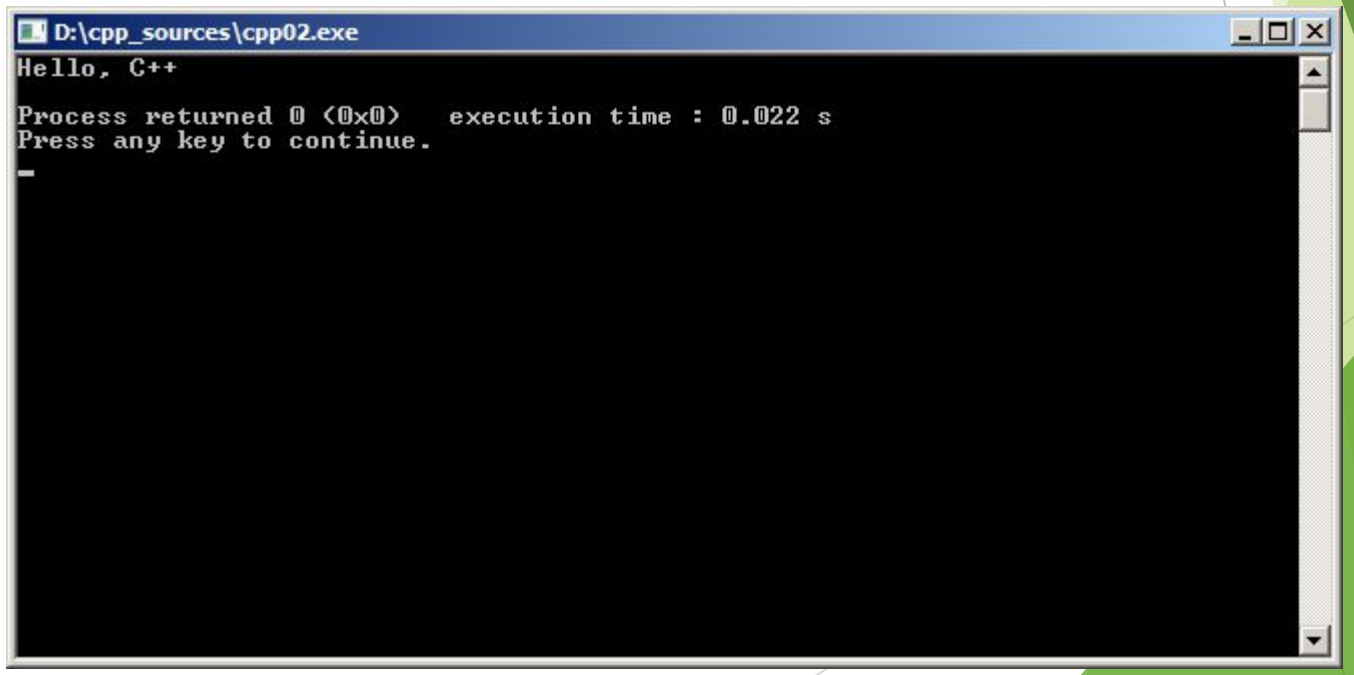
Вывод на экран

Start here | cpp02.cpp

```
1  #include<iostream>
2
3  int main()
4  {
5      std::cout<<"Hello C++"<<std::endl;
6      return 0;
7  }
8
```


*cpp01.cpp - Code::Blocks 16.01
File Edit View Search Project Build Debug Fortran wxSmith Tools
Build Ctrl-F9
Compile current file Ctrl-Shift-F9
Run Ctrl-F10
Build and run F9
Rebuild Ctrl-F11
Clean
Build workspace
Rebuild workspace
Clean workspace
Management
Projects Symbols Files
Workspace
D:\cpp_sources\cpp02.exe
Hello C++
Process returned 0 (0x0) execution time : 0.017 s
Press any key to continue.

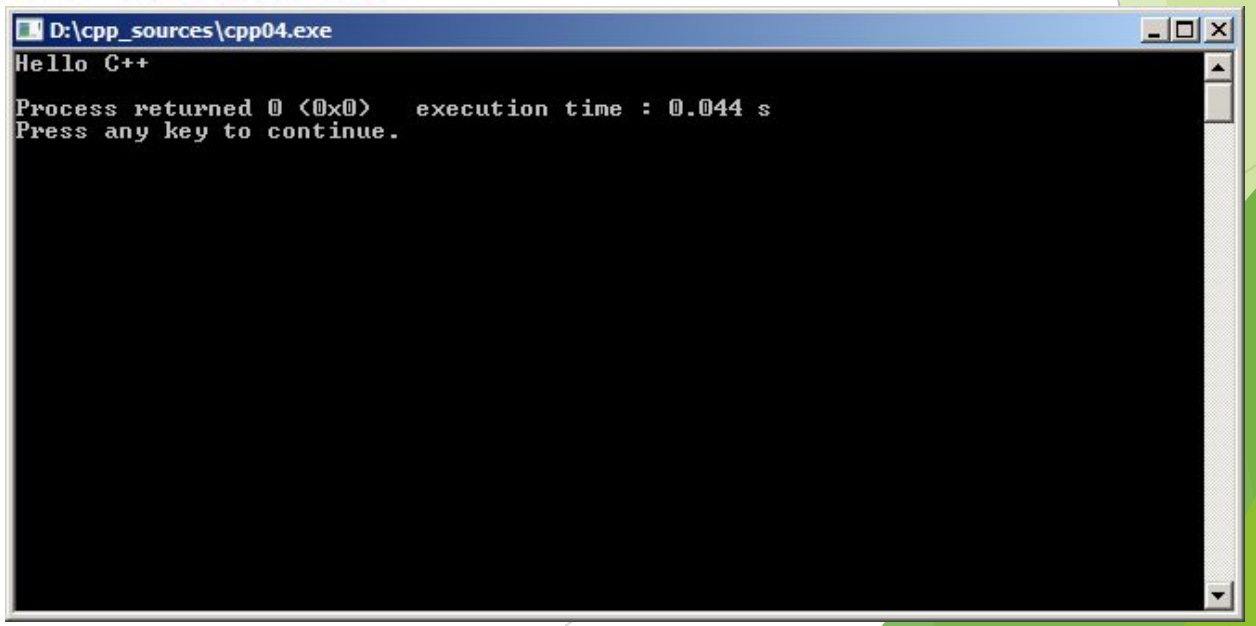
```cpp
#include<iostream>
#include<stdio.h>

int main()
{
    //std::cout<<"Hello C++"<<std::endl;
    printf("Hello, C++ \n");
    return 0;
}
```



Использование пространства имен

```
#include<iostream>
//#include<stdio.h>

using namespace std;
int main()
{

    cout<<"Hello C++"<<endl;

    return 0;
}
```

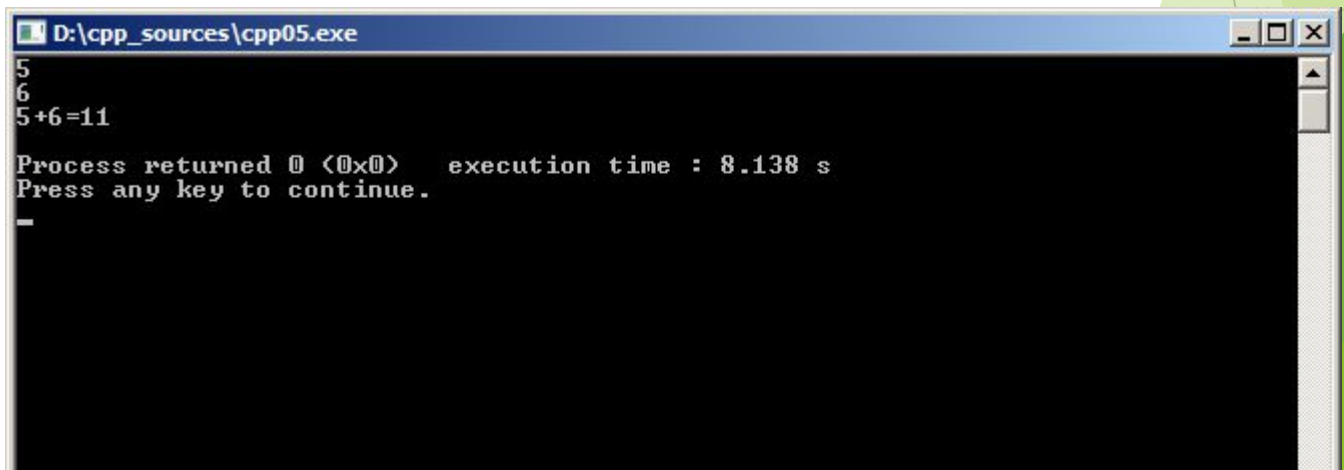
```cpp
#include<iostream>
//#include<stdio.h>

using namespace std;
int main()
{
    int cout=5;
    std::cout<<"Hello C++"<<std::endl;

    return 0;
}
```



```cpp
#include<iostream>
//#include<stdio.h>

using namespace std;
int main()
{
    int cout=5;
    std::cout<<cout<<std::endl;

    return 0;
}
```

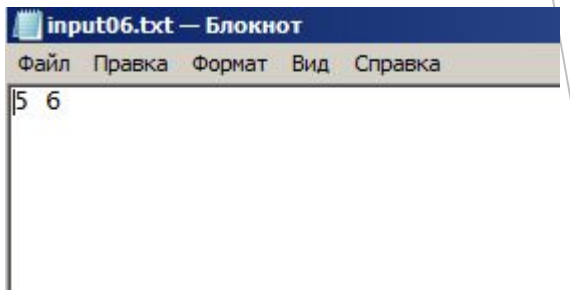
Ввод и вывод

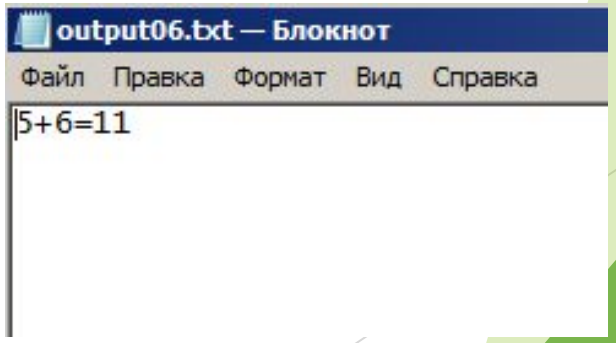
```cpp
#include<iostream>
//#include<stdio.h>

using namespace std;
int main()
{
    int a,b,res;
    cin>>a>>b;
    res=a+b;
    cout<<a<<"+"<<b<<"="<<res<<endl;
    return 0;
}
```



Чтение и запись в файл

```cpp
#include<iostream>
#include<fstream>

using namespace std;
int main()
{
    ifstream cin("input06.txt");
    ofstream cout("output06.txt");
    int a,b,res;
    cin>>a>>b;
    res=a+b;
    cout<<a<<"+"<<b<<"="<<res<<endl;
    return 0;
}
```





```cpp
#include<iostream>
#include<fstream>

using namespace std;
int main()
{
    ifstream cin("input06.txt");
    ofstream cout("output06.txt");
    int a,b,res;
    cin>>a>>b;
    res=a+b;
    cout<<a<<"+"<<b<<"="<<res<<endl;
    std::cout<<a<<"+"<<b<<"="<<res<<std::endl;
    return 0;
}
```

Коментарии

```
1   #include <iostream>
2   int main(int argc, char const *argv[])
3   {
4
5       int x;
6       x=5;
7       std::cout<<x;
8       //std::cin.get();
9       return 0;
10      // коментарий
11      /* многострочный
12      коментарий */
13  }
```

Основные типы данных

- int (целый);
- char (символьный);
- wchar_t (расширенный символьный);
- bool (логический);
- float (вещественный);
- double (вещественный с двойной точностью).

Спецификаторы типа

- short (короткий);
- long (длинный);
- signed (знаковый);
- unsigned (беззнаковый).

Диапазоны значений

Тип	Диапазон значений	Размер (байт)
bool	true и false	1
signed char	-128 … 127	1
unsigned char	0 … 255	1
signed short int	-32 768 … 32 767	2
unsigned short int	0 … 65 535	2
signed long int	-2 147 483 648 … 2 147 483 647	4
unsigned long int	0 … 4 294 967 295	4
float	3.4e-38 … 3.4e+38	4
double	1.7e-308 … 1.7C+308	8
long double	3.4e-4932 … 3.4e+4932	10

- **double** 8 байт -1.7*10**308..1.7*10**308-1, 1.7*10**(-308)
- **int** 4 байта -2**31..2**31-1
- **long long** 8 байт -2**63..2**63-1
- unsigned int 4 байта 0..2**32-1
- unsigned long 8 байт 0..2*64-1
- char 1 байт 256 значений
- bool 1 байт true(1) false (0)
- string стоковый тип (класс)

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    double d1,d2;
    long long l1,l2;
    int i1,i2;
    unsigned int ui1;
    unsigned long long ul1;
    char c1,c2;
    bool b1,b2;
    string s;
    return 0;
}
```

Операции с вещественными числами

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    double a,b;
    cin >>a>>b;
    cout<<a+b<<endl
        <<a-b<<endl
        <<a*b<<endl
        <<a/b<<endl;
    return 0;
}
```

```
5.0000
7.0000
```

```
12
-2
35
0.714286
```

Операции с целыми числами

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    int a,b;
    cin >>a>>b;
    cout<<a+b<<endl
        <<a-b<<endl
        <<a*b<<endl
        <<a/b<<endl
        <<a%b<<endl;
    return 0;
}
```

```
5
7
```

```
12
-2
35
0
5

```

Операции с логическими переменными

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    bool a=true, b=false;
    bool _and, _or, _not;
    _and= a&&b;
    _or= a||b;
    _not=!a;
    cout<<_and<<endl
        <<_or<<endl
        <<_not<<endl;
    return 0;
}
```

```
1   0
2   1
3   0
4
```

char

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    char a,b;
    cin>>a>>b;
    cout<<a<<" "<<b<<endl
        <<a+b<<endl;
    return 0;
}
```

```
1 1
2 2
```

```
1 2
99
```

string

```
1   #include <iostream>
2   #include <fstream>
3
4   using namespace std;
5
6   int main(int argc, char const *argv[])
7   {
8       ifstream cin("003in.txt");
9       ofstream cout("005out.txt");
10
11      string a,b;
12      cin>>a>>b;
13      cout<<a+b<<endl;
14      return 0;
15  }
```

```
1   1
2   2
```

```
1   12
2
```

Сравнение величин

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    cout << (123>=124)<<endl
         << (123==123)<<endl
         << (123>124)<<endl
         << (123<=124)<<endl
         << (123<124)<<endl
         <<('a'!='c')<<endl
         <<('a'<='z')<<endl
         <<(false<true)<<endl;

    return 0;
}
```

```
1  0
2  1
3  0
4  1
5  1
6  1
7  1
8  1
9
```

Преобразование типов явное

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    long long a;
    cin >>a;
    cout <<double(a);

    return 0;
}
```

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    double a,b;
    cin >>a>>b;
    cout<<int(a)<<endl
        <<(long long)(b)<<endl;

    return 0;
}
```

```
1   1.111
2   2.555
```

```
1   1
2   2
3
```

Преобразование char

```
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    char a;
    cin >>a;
    cout<<a<<endl
        <<(int)(a)<<endl
        <<double(a)<<endl;

    return 0;
}
```

Возвращает номер символа в таблице

```
1  5
2  53
3  53
4
```

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    int a,b;
    double c;
    cin >>a>>b>>c;
    cout<<a<<endl
        <<(char)(a)<<endl
        <<char(b)<<endl
        <<char(c)<<endl;

    return 0;
}
```

```
1   90
2   346
3   2.555
```

```
1   90
2   Z
3   Z
```

Возвращает символ с указанным номером
Если число не попадает в диапазон 0..255
заменяется на остаток от деления на 256

Преобразование bool

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    int a,b,c;
    double d1,d2,d3;
    cin >>a>>b>>c
        >>d1>>d2>>d3;
    cout<<bool(a)<<bool(b)<<bool(c)
        <<bool(d1)<<bool(d2)<<bool(d3);

    return 0;
}
```

```
1   8 0 -8
2   0.001 12.6 17
```

```
101
111
```

Неявное преобразование

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    int a;
    cin >>a;
    cout <<0.0+a;


    return 0;
}
```

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    int a,b;
    cin >>a>>b;
    cout <<double(a)/double(b)<<endl
         <<1.0*a/b<<endl;


    return 0;
}
```

```cpp
#include <iostream>
#include <fstream>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    char c1='1',c2='2';
    bool b1=true, b2=true;
    //cin>>c1>>c2;
    cout<<c1<<"+"<<c2<<"="<<c1+c2<<endl
        <<b1*3+b2*10<<endl;


    return 0;
}
```

```
1+2=99
13
```

’1’ в 49
‘2’ в 50

Математические функции abs

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    int a;
    double b;
    cin >>a>>b;
    cout<<abs(a)<<endl
        <<abs(b)<<endl;


    return 0;
}
```

```
1   -15
2   -3.14
```

```
1   15
2   3.14
3
```

sqrt

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    int i1,i2;
    double d1,d2;
    cin >>i1>>i2
        >>d1>>d2;
    cout<<sqrt(i1)<<" "<<sqrt(i2)<<endl
        <<sqrt(d1)<<" "<<sqrt(d2)<<endl;


    return 0;
}
```

```
1   16 25
2   2.14 -3.14
```

```
4 5
1.46287 nan
```

round

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    double d1,d2,d3,d4;
    cin >>d1>>d2>>d3>>d4;
    cout<<round(d1)<<endl
        <<round(d2)<<endl
        <<round(d3)<<endl
        <<round(d4)<<endl;


    return 0;
}
```

```
1   2 2.4 2.5 2.6 -2.5 -2.6
```

```
1   2
2   2
3   3
4   3
5
```

asin, acos, atan

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    double d1,d2,d3;
    double pi=acos(-1);
    cin >>d1>>d2>>d3;
    cout<<asin(d1)<<endl
        <<acos(d2)<<endl
        <<atan(d3)<<endl
        <<pi<<endl;


    return 0;
}
```

```
1  2 2.4 2.5 2.6 -2.5 -2.6
```

```
1  nan
2  nan
3  1.19029
4  3.14159
5
```

sin, cos, tan

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    double d1,d2,d3;
    double pi=acos(-1);
    cout<<sin(pi/6)<<" "<<sin(pi/3)<<endl
        <<cos(pi/6)<<" "<<cos(pi/3)<<endl
        <<tan(pi/6)<<" "<<tan(pi/3)<<endl;


    return 0;
}
```

```
0.5 0.866025
0.866025 0.5
0.57735 1.73205
```

exp, log

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    double d1,d2,d3,d4;
    cin>>d1>>d2>>d3>>d4;
    cout<<exp(d1)<<" "<<exp(d2)<<" "<<exp(d3)<<" "<<exp(d4)<<endl
        <<log(d1)<<" "<<log(d2)<<" "<<log(d3)<<" "<<log(d4)<<endl;


    return 0;
}
```

```
1 1 2 0 -1
```

```
2.71828 7.38906 1 0.367879
0 0.693147 -inf nan

```

pow

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    double d1,d2,d3,d4;
    cin>>d1>>d2>>d3>>d4;
    cout<<pow (2,10)<<endl
        <<pow (-2,10)<<endl
        <<pow (4,1.6)<<endl
        <<pow (-4,1.6)<<endl
        <<pow (0,0)<<endl
        <<pow (0,-5)<<endl;


    return 0;
}
```

```
1024
1024
9.18959
nan
1
inf
```

Форматный вывод

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    double a;
    cin>>a;
    cout<<int(a)<<"."<<int(abs(round((a-int(a))*1E8)));


    return 0;
}
```

```
1   -3.14159265358979323846264338
```

```
-3.14159265
```

Управление форматом ввода-вывода

- Флаги
- Методы
- Манипуляторы

Флаги

- 0001011100

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    cout<<"cout flags: "<<cout.flags()<<endl;
    cout<<"cin flgs: "<<cin.flags()<<endl;


    return 0;
}
```

```
1   cout flags: 4098
2   cin flgs: 4098
3
```

setf
unsetf

dec
oct
hex

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    cout.setf(ios::dec);
    cout<<"cout: "<<cout.flags()<<endl
        <<" dec: "<<200<<endl;
    cout.setf(ios::oct);
    cout<<"cout: "<<cout.flags()<<endl
        <<" oct: "<<200<<endl;
    cout.setf(ios::hex);
    cout<<"cout: "<<cout.flags()<<endl
        <<" hex: "<<200<<endl;


    return 0;
}
```

```
cout: 4098
 dec: 200
cout: 4162
 oct: 200
cout: 4170
 hex: 200
```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    cout.setf(ios::dec);
    cout<<"cout: "<<cout.flags()<<endl
        <<" dec: "<<200<<endl;
    cout.unsetf(ios::dec);
    cout.setf(ios::oct);
    cout<<"cout: "<<cout.flags()<<endl
        <<" oct: "<<200<<endl;
    cout.unsetf(ios::oct);
    cout.setf(ios::hex);
    cout<<"cout: "<<cout.flags()<<endl
        <<" hex: "<<200<<endl;


    return 0;
}
```

```
cout: 4098
 dec: 200
cout: 10100
 oct: 310
cout: 1008
 hex: c8
```

ios::showbase ios::uppercase

```
cout.setf(ios::dec|ios::showbase|ios::uppercase);
cout<<"cout: "<<cout.flags()<<endl
    <<" dec: "<<255<<endl;
cout.unsetf(ios::dec);
cout.setf(ios::oct);
cout<<"cout: "<<cout.flags()<<endl
    <<" oct: "<<255<<endl;
cout.unsetf(ios::oct);
cout.setf(ios::hex);
cout<<"cout: "<<cout.flags()<<endl
    <<" hex: "<<255<<endl;
```

```
cout: 20994
 dec: 255
cout: 051100
 oct: 0377
cout: 0X5208
 hex: 0XFF
```

ios::showpos

```
cout.setf(ios::dec|ios::showbase|ios::uppercase|ios::showpos);
cout<<"cout: "<<cout.flags()<<endl
    <<" dec: "<<255<<endl;
cout.unsetf(ios::dec);
cout.setf(ios::oct);
cout<<"cout: "<<cout.flags()<<endl
    <<" oct: "<<255<<endl;
cout.unsetf(ios::oct);
cout.setf(ios::hex);
cout<<"cout: "<<cout.flags()<<endl
    <<" hex: "<<255<<endl;
```

```
cout: 23042
 dec: +255
cout: 055100
 oct: 0377
cout: 0X5A08
 hex: 0XFF
```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    int a;
    cin.setf(ios::oct);
    cin.unsetf(ios::dec);
    cin>>a;
    cout<<a;



    return 0;
}
```

```
1  255
```

```
1  173
```

ios::boolalpha

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    bool a,b;
    cin >>a>>b;
    //cout<<"cin: "<<cin.flags()<<endl;
    cout<<"cout: "<<cout.flags()<<" "<<"bool alpha off "<<a<<" "<<b<<endl;
    cout.setf(ios::boolalpha);
    cout<<"cout: "<<cout.flags()<<" "<<"bool alpha off "<<a<<" "<<b<<endl;



    return 0;
}
```

```
1 1 0
```

```
cout: 4098 bool alpha off 1 0
cout: 4099 bool alpha on true false

```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");


    bool a,b;
    cin.setf(ios::boolalpha);
    cin >>a>>b;
    //cout<<"cin: "<<cin.flags()<<endl;
    cout<<"cout: "<<cout.flags()<<" "<<"bool alpha off "<<a<<" "<<b<<endl;
    cout.setf(ios::boolalpha);
    cout<<"cout: "<<cout.flags()<<" "<<"bool alpha on "<<a<<" "<<b<<endl;



    return 0;
}
```

```
1 true false
```

```
1 cout: 4098 bool alpha off 1 0
2 cout: 4099 bool alpha on true false
3
```

ios::skipws

```
ifstream cin("003in.txt");
ofstream cout("005out.txt");

char c;
cin >>c;
cout<<"cin: "<<cin.flags()<<endl;
cout<<"cout: "<<cout.flags()<<endl
    <<" skipws on: "<<c<<" "<<int(c)<<endl;

cin.close();
cin.open("003in.txt");
cin.unsetf(ios::skipws);
cin >>c;
cout<<"cin: "<<cin.flags()<<endl;
cout<<"cout: "<<cout.flags()<<endl
    <<" skipws off: "<<c<<" "<<int(c)<<endl;
```

```
1       Z
```

```
cin: 4098
cout: 4098
 skipws on: Z 90
cin: 2
cout: 4098
 skipws off:   32
```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    int c;
    cin >>c;
    cout<<"cin: "<<cin.flags()<<endl;
    cout<<"cout: "<<cout.flags()<<endl
        <<" skipws on: "<<c<<endl;

    cin.close();
    cin.open("003in.txt");
    cin.unsetf(ios::skipws);
    cin >>c;
    cout<<"cin: "<<cin.flags()<<endl;
    cout<<"cout: "<<cout.flags()<<endl
        <<" skipws off: "<<c<<" "<<endl;



    return 0;
}
```

```
1       200
```

```
cin: 4098
cout: 4098
 skipws on: 200
cin: 2
cout: 4098
 skipws off: 0
```

ios::showpoint

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    double a,b;
    cin>>a>>b;
    cout <<"cin: "<<cin.flags()<<endl;
    cout <<"cout: "<<cout.flags()<<endl
         <<a<<endl
         <<b<<endl;

    return 0;
}
```

```
12
1234567890
```

```
cin: 4098
cout: 4098
12
1.23457e+09
```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    double a,b;
    cin>>a>>b;
    cout <<"cin: "<<cin.flags()<<endl;
    cout <<"cout: "<<cout.flags()<<endl
         <<a<<endl
         <<b<<endl;
    cout.setf(ios::showpoint);
    cout <<"cout: "<<cout.flags()<<endl
         <<a<<endl
         <<b<<endl;

    return 0;
}
```

```
cin: 4098
cout: 4098
12
1.23457e+08
cout: 5122
12.0000
1.23457e+08
```

ios::fixed

```
    <<b<<endl;
cout.setf(ios::fixed);
cout <<"cout: "<<cout.flags()<<endl
     <<a<<endl
     <<b<<endl;
```

```
cin: 4098
cout: 4098
12
1.23457e+09
cout: 4102
12.000000
1234567890.000000
```

ios::scientific

```
cout.setf(ios::fixed);
cout <<"cout: "<<cout.flags()<<endl
     <<a<<endl
     <<b<<endl;
cout.unsetf(ios::fixed);
cout.setf(ios::scientific);
cout <<"cout: "<<cout.flags()<<endl
     <<a<<endl
     <<b<<endl;
```

```
cout: 4102
12.000000
1234567890.000000
cout: 4354
1.200000e+01
1.234568e+09
```

Метод cout.precision()

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    double a,b;
    cin>>a>>b;
    cout <<"cin: "<<cin.flags()<<endl;
    cout.precision(3);
    cout <<"cout: "<<cout.flags()<<endl
         <<a<<endl
         <<b<<endl;
    cout.setf(ios::fixed);
    cout <<"cout: "<<cout.flags()<<endl
         <<a<<endl
         <<b<<endl;
    cout.unsetf(ios::fixed);
    cout.setf(ios::scientific);
    cout <<"cout: "<<cout.flags()<<endl
         <<a<<endl
         <<b<<endl;

    return 0;
}
```

```
1   12
2   1234567890
```

```
12.555666
1234567890
```

```
cin: 4098
cout: 4098
12
1.23e+09
cout: 4102
12.000
1234567890.000
cout: 4354
1.200e+01
1.235e+09
```

```
cin: 4098
cout: 4098
12.6
1.23e+09
cout: 4102
12.556
1234567890.000
cout: 4354
1.256e+01
1.235e+09
```

Отмена настроек точности вывода

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    double a,b;
    cin>>a>>b;
    cout <<"cin: "<<cin.flags()<<endl;
    cout.precision(3);
    cout <<"cout: "<<cout.flags()<<endl
         <<a<<endl
         <<b<<endl;
    cout.precision(-1);
    cout <<"cout: "<<cout.flags()<<endl
         <<a<<endl
         <<b<<endl;

    return 0;
}
```

```
1   cin: 4098
2   cout: 4098
3   12.6
4   1.23e+09
5   cout: 4098
6   12.5557
7   1.23457e+09
```

ios::right ios::left cout.width()

```
int a,b;
cin>>a>>b;
cout.setf(ios::right);
cout <<"cin: "<<cin.flags()<<endl;
cout<<a<<endl<<b<<endl;
cout.width(10);
cout<<a;
cout.width(10);
cout<<b<<endl;

cout.unsetf(ios::right);
cout.setf(ios::left);
cout <<"cin: "<<cin.flags()<<endl;
cout<<a<<endl<<b<<endl;
cout.width(15);
cout<<a;
cout.width(15);
cout<<b<<endl;
```

```
1 1 1234
```

```
1.015 1234.1525
```

```
cin: 4098
1
1234
         1      1234
cin: 4098
1
1234
1               1234

```

```
cin: 4098
1.015
1234.15
     1.015   1234.15
cin: 4098
1.015
1234.15
1.015           1234.15
```

cout.fill('*');

```
cout.width(10);
cout.fill('*');
cout<<a;
cout.width(10);
cout<<b<<endl;
```

```
cin: 4098
1.015
1234.15
*****1.015***1234.15
```

```
cout.fill(12);
cout<<a;
cout.width(10);
cout<<b<<endl;
```

```
cin: 4098
1.015
1234.15
FFFFFF1.015FFFFFF1234.15
```

Манипуляторы dec oct hex

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    int a;
    cin>>a;
    cout<<"dec: "<<a<<endl
        <<oct
        <<"oct: "<<a<<endl
        <<hex
        <<"hex: "<<a<<endl;

    return 0;
}
```

```
1   124
```

```
1   dec: 124
2   oct: 174
3   hex: 7c
4
```

Манипуляторы fixed scientific

```cpp
#include <iostream>
#include <fstream>
#include <cmath>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    double a;
    cin>>a;
    cout<<"dec: "<<a<<endl
        <<fixed
        <<"fixed: "<<a<<endl
        <<scientific
        <<"scientific: "<<a<<endl;
    cout.unsetf(ios::fixed|ios::scientific|ios::showpoint);
    cout<<a;

    return 0;
}
```

```
1   124.45472372
```

```
1   dec: 124.455
2   fixed: 124.454724
3   scientific: 1.244547e+02
4   124.455
```

#include <iomanip> setprecision(5)

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    double a;
    cin>>a;
    cout<<fixed<<setprecision(5)<<a<<endl
        <<scientific<<setprecision(-1)<<a<<endl;
    cout.unsetf(ios::fixed|ios::scientific|ios::showpoint);

    return 0;
}
```

```
1   124.45472372
```

```
1   124.45472
2   1.244547e+02
3
```

setfill('.') setw(20) left right

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    double a;
    cin>>a;
    cout<<fixed<<setfill('.')<<setw(20)<<a<<endl
        <<setw(20)<<left<<a<<endl;
    cout.unsetf(ios::fixed|ios::scientific|ios::showpoint);

    return 0;
}
```

```
1   124.45472372
```

```
..........124.454724
124.454724..........
```

Функции

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int sum(int,int); //прототип

int sum(int a, int b){ //описание
    cout <<"before return"<<endl;
    return a+b;
    cout <<"after return"<<endl;
}



int main(int argc, char const *argv[])
{
    cout<<sum(1,2);
    return 0;
}
```

```
before return
3[Finished in 0.3s]
```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int calc(int a, int b){
    return sum(a,b);
}

int sum(int a, int b){ //описание
    return a+b;
}



int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a=10;
    cout<<calc(a,a*2);
    return 0;
}
```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int calc(int a, int b){
    return sum(a,b);
}

int sum(int a, int b){ //описание
    return a+b;
}



int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a=10;
    cout<<calc(a,a*2);
    return 0;
}
```

error: use of undeclared identifier 'sum'

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int sum(int,int);
int calc(int,int);

int calc(int a, int b){
    return sum(a,b);
}

int sum(int a, int b){ //описание
    return a+b;
}



int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a=10;
    cout<<calc(a,a*2);
    return 0;
}
```

```
30
```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int sum(int,int);
int calc(int,int);

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a=10;
    cout<<calc(a,a*2);
    return 0;
}

int calc(int a, int b){
    return sum(a,b);
}

int sum(int a, int b){ //описание
    return a+b;
}
```

```
30
```

Перегружаемая функция 1

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int sum(int,int);
int calc(int,int);

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    cout<<calc(20,10)<<endl<<calc(20.0,10.0);
    return 0;
}

int calc(int a, int b){
    return sum(a,b);
}

int sum(int a, int b){ //описание
    return a+b;
}

double calc(double a, double b){
    return a-b;
}
```

```
1  30
2  30
```

Перегружаемая функция 2

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int sum(int,int);
int calc(int,int);
double calc(double,double);

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    cout<<calc(20,10)<<endl<<calc(20.0,10.0);
    return 0;
}

int calc(int a, int b){
    return sum(a,b);
}

int sum(int a, int b){ //описание
    return a+b;
}

double calc(double a, double b){
    return a-b;
}
```

```
1  30
2  10
```

Области видимости

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int a=1;

int test(){
    cout<<"test 1: "<<a<<endl;
    a=33;
    cout<<"test 2: "<<a<<endl;
    return 0;
}

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");

    cout <<"main 1: "<<a<<endl;
    a=2;
    cout <<"main 2: "<<a<<endl;
    test();
    cout <<"main 3: "<<a<<endl;
    return 0;
}
```

```
test 1: 2
test 2: 33
[Finished in 0.3s]
```

```
1  main 1: 1
2  main 2: 2
3  main 3: 33
4
```

~/Desktop/cpp/new01/005out.txt

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int a=1;
ifstream in("003in.txt");
ofstream out("005out.txt");

int test(){
    out<<"test 1: "<<a<<endl;
    a=33;
    out<<"test 2: "<<a<<endl;
    return 0;
}

int main(int argc, char const *argv[])
{


    out <<"main 1: "<<a<<endl;
    a=2;
    out <<"main 2: "<<a<<endl;
    test();
    out <<"main 3: "<<a<<endl;
    return 0;
}
```

```
1  main 1: 1
2  main 2: 2
3  test 1: 2
4  test 2: 33
5  main 3: 33
6
```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int a=1;
ifstream in("003in.txt");
ofstream out("005out.txt");

int test(){
    out<<"test 1: "<<a<<endl;
    a=33;
    out<<"test 2: "<<a<<endl;
    return 0;
}

int main(int argc, char const *argv[])
{
    out <<"main 1: "<<a<<endl;
    int a=2;
    out <<"main 2: "<<a<<endl;
    test();
    out <<"main 3: "<<a<<endl;
    return 0;
}
```

```
main 1: 1
main 2: 2
test 1: 1
test 2: 33
main 3: 2
```

Использование локальных областей

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int a=1;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    cout <<"main 1: "<<a<<endl;
    int a=2;
    cout <<"main 2: "<<a<<endl;
    {
        cout<<"loc 1: "<<a<<endl;
        a=3;
        cout<<"loc 2:"<<a<<endl;
    }

    cout <<"main 3: "<<a<<endl;
    return 0;
}
```

```
main 1: 1
main 2: 2
loc 1: 2
loc 2:3
main 3: 3
```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int a=1;


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    cout <<"main 1: "<<a<<endl;
    int a=2;
    cout <<"main 2: "<<a<<endl;
    {
        cout<<"loc 1: "<<a<<endl;
        int a=3;
        cout<<"loc 2:"<<a<<endl;
    }

    cout <<"main 3: "<<a<<endl;
    return 0;
}
```

```
main 1: 1
main 2: 2
loc 1: 2
loc 2:3
main 3: 2
```

Структуры

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

struct Points{
    double x,y;
};

Points med(Points A,Points B){
    Points RES;
    RES.x=(A.x+B.x)/2;
    RES.y=(A.y+B.y)/2;
    return RES;
}

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    Points A,B,M;
    cin>>A.x>>A.y>>B.x>>B.y;
    M=med(A,B);
    cout<<M.x<<" "<<M.y;

    return 0;
}
```

```
1   12 44 2 47
```

```
1   7 45.5
```

Поменять 2 числа местами

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

void swap(int a,int b){
    int t;
    t=a;
    a=b;
    b=t;
}

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a=1,b=2;
    cout<<a<<" "<<b<<endl;
    swap(a,b);
    cout<<a<<" "<<b<<endl;

    return 0;
}
```

```
1   1 2
2   1 2
3
```

& взятие адреса

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

void swap(int &a,int &b){
    int t;
    t=a;
    a=b;
    b=t;
}

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a=1,b=2;
    cout<<a<<" "<<b<<endl;
    swap(a,b);
    cout<<a<<" "<<b<<endl;

    return 0;
}
```

```
1 2
2 1
```

switch case

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    char op;
    int a,b;
    cin>>a>>op>>b;
    cout<<a<<op<<b<<"=";
    switch(op){
        case'-':cout<<a-b<<endl;
        case'+':cout<<a+b<<endl;
        case'*':cout<<a*b<<endl;
        case'/':cout<<a/b<<endl;
    }
    return 0;
}
```

```
1   10/4
```

```
1   10-4
```

```
1   10/4=2
```

```
1   10-4=6
2   14
3   40
4   2.5
5
```

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    char op;
    int a,b;
    cin>>a>>op>>b;
    cout<<a<<op<<b<<"=";
    switch(op){
        case'-':cout<<a-b<<endl; break;
        case'+':cout<<a+b<<endl; break;
        case'*':cout<<a*b<<endl; break;
        case'/':cout<<a/1.0/b<<endl; break;
    }
    return 0;
}
```

```
10-4=6
```

```
switch(op){
    case'-':cout<<a-b<<endl; break;
    case'+':cout<<a+b<<endl; break;
    case'*':cout<<a*b<<endl; break;
    case'/':cout<<a/1.0/b<<endl; break;
    default: cout<<"error"<<endl;
}
```

```
1  10^4=error
2
```

Локальная область видимости внутри case

```
switch(op){
    default: cout<<"error"<<endl;
    case'-':{
        int res=a-b;
        cout<<res<<endl;
        break;
    }
    case'+':cout<<a+b<<endl; break;
    case'*':cout<<a*b<<endl; break;
    case'/':cout<<a/1.0/b<<endl; break;

}
return 0;
```

if

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    cin>>a;
    if(a>0)cout<<"positive";
    else cout<<"negative";
    return 0;
}
```

```
1  10
```

```
1  positive
```

else if

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    cin>>a;
    if(a==0)cout<<"zero";
        else if(a>0)cout<<"positive";
        else cout<<"negative";
    return 0;
}
```

Блок операторов в if’е

```
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    cin>>a;
    if(a==0)cout<<"zero";
        else if(a>0)cout<<"positive";
        else {
            cout<<"negative";
            a=-a;
        }
        cout<<endl<<a;
    return 0;
}
```

```
1  -1
```

```
1  negative
2  1
```

Локальная область видимости

```
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    cin>>a;
    if(a==0)cout<<"zero";
        else if(a>0)cout<<"positive";
        else {
            cout<<"negative";
            int a=3;
            cout<<endl<<a;
        }
        cout<<endl<<a;
    return 0;
}
```

```
1   negative
2   3
3   -1
```

Использование неявного преобразования типов

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    cin>>a;
    if(a%3) cout<<"not devided";
    else cout<<"devided";
    return 0;
}
```

```
1  9
```

```
1  devided
```

Структура для времени

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;
struct Time{
    int h,m,s;
};

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    Time t;
    cin>>t.h>>t.m>>t.s;
    cout<<t.h<<":"<<t.m<<":"<<t.s;
    return 0;
}
```

```
1  8 1 12
```

```
1  8:1:12
```

Функции внутри структур

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;
struct Time{
    int h,m,s;
    void read (istream &cin){
        cin>>h>>m>>s;
    }
    void write(ostream &cout){
        cout<<h/10<<h%10<<":"
            <<m/10<<m%10<<":"
            <<s/10<<s%10<<endl;
    }
};

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    Time t;
    t.read(cin);
    t.write(cout);
    return 0;
}
```

```
1   8 1 12
```

```
1   08:01:12
2
```

```
struct Time{
    int h,m,s;
    void read (istream &cin){
        cin>>h>>m>>s;
    }
    void write(ostream &cout){
        cout<<h/10<<h%10<<":"
            <<m/10<<m%10<<":"
            <<s/10<<s%10<<endl;
    }
    void correct(){
        m+=s/60;
        s%=60;
        h+=m/60;
        m%=60;
        h%=24;
    }
};
```

```
1  80 1111 12
```

```
1  02:31:12
2
```

```
struct Time{
    int h,m,s;
    void read (istream &cin){
        cin>>h>>m>>s;
    }
    void write(ostream &cout){
        cout<<h/10<<h%10<<":"
            <<m/10<<m%10<<":"
            <<s/10<<s%10<<endl;
    }
    void correct(){
        m+=s/60;
        s%=60;
        h+=m/60;
        m%=60;
        h%=24;
    }
    bool iscorrect(){
        return h>=0&&h<24&&m>=0&&m<60&&s>=0&&s<60;
    }
};
```

```
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    Time t;
    t.read(cin);
    if (!t.iscorrect()) cout<<"incorrect input \n";
    t.correct();
    t.write(cout);
    return 0;
}
```

```
struct Time{
    int h,m,s,err;
    void read (istream &cin){
        cin>>h>>m>>s;
        err=!iscorrect();
        correct();
    }
    void write(ostream &cout){
        cout<<h/10<<h%10<<":"
            <<m/10<<m%10<<":"
            <<s/10<<s%10<<endl;
    }
    void writeerror(ostream &cout){
        if (err==1)cout<<"incorrect input \n";
    }
    void correct(){
        m+=s/60;
        s%=60;
        h+=m/60;
        m%=60;
        h%=24;
    }
    bool iscorrect(){
        return h>=0&&h<24&&m>=0&&m<60&&s>=0&&s<60;
    }
};
```

```
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    Time t;
    t.read(cin);
    t.writeerror(cout);
    t.write(cout);
    return 0;
}
```

```
1  incorrect input
2  02:31:12
3
```

```
struct Time{
    int h,m,s,err;
    Time& read(istream &cin){
        cin>>h>>m>>s;
        err=!iscorrect();
        correct();
        return *this;
    }
    Time& write(ostream &cout){
        cout<<h/10<<h%10<<":"
            <<m/10<<m%10<<":"
            <<s/10<<s%10<<endl;
        return *this;
    }
    Time& writeerror(ostream &cout){
        if (err==1)cout<<"incorrect input \n";
        return *this;
    }
    void correct(){
        m+=s/60;
        s%=60;
        h+=m/60;
        m%=60;
        h%=24;
    }
    bool iscorrect(){
        return h>=0&&h<24&&m>=0&&m<60&&s>=0&&s<60;
    }
};
```

```
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    Time t;
    t.read(cin)
    .writeerror(cout)
    .write(cout);
    return 0;
}
```

```
1  incorrect input
2  02:31:12
3
```

Сравнение двух времен в лоб

```
struct Time{
    int h,m,s,err;
    Time& read(istream &cin){ //метод возвращает исходный объект
        cin>>h>>m>>s;
        err=!iscorrect();
        correct();
        return *this;
    }
    Time& write(ostream &cout){
        cout<<h/10<<h%10<<":"
            <<m/10<<m%10<<":"
            <<s/10<<s%10<<endl;
        return *this;
    }
    Time& writeerror(ostream &cout){
        if (err==1)cout<<"incorrect input \n";
        return *this;
    }
    void correct(){
        m+=s/60;
        s%=60;
        h+=m/60;
        m%=60;
        h%=24;
    }
    bool iscorrect(){
        return h>=0&&h<24&&m>=0&&m<60&&s>=0&&s<60;
    }
    bool ismorethen(Time B){
        return 3600*h+60*m+s>3600*B.h+60*B.m+B.s;
    }
};
```

```
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    Time t1,t2;
    t1.read(cin);
    t2.read(cin);
    if(t1.ismorethen(t2)) cout<<"t1>t2";
        else cout<<"t2>t1";
    return 0;
}
```

```
1   80 1111 12
2   17 111 11
```

```
1   t2>t1
```

Сравнение двух времен через перегрузку оператора

```
bool operator > (Time A,Time B){
    return A.ismorethen(B);
}

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    Time t1,t2;
    t1.read(cin);
    t2.read(cin);
    if(t1>t2) cout<<"t1>t2";
        else cout<<"t2>t1";
    return 0;
}
```

Перегрузка ввода и вывода

```
istream& operator>>(istream &cin, Time &A){
    A.read(cin);
    return cin;
}
ostream& operator<<(ostream &cout, Time &A){
    A.write(cout);
    return cout;
}


int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    Time t1,t2;
    cin>>t1>>t2;
    cout<<t1<<t2;
    if(t1>t2) cout<<"t1>t2";
        else cout<<"t2>t1";
    return 0;
}
```

```
000 01 01
222 22 22
```

```
1   00:01:01
2   06:22:22
3   t2>t1
```

Цикл while

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    cin>>a;
    while(a){
        cout<<a%10;
        a/=10;
    }
    return 0;
}
```

```
1  123456
```

```
1  654321
```

Выход из цикла при встрече 0

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    cin>>a;
    while(a){
        if(!(a%10))break;
        cout<<a%10;
        a/=10;
    }
    return 0;
}
```

```
1  1230456
```

```
1  654
```

Пропуск 0

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    cin>>a;
    while(a){
        int t=a%10;
        a/=10;
        if(!t) continue;
        cout<<t;
    }
    return 0;
}
```

```
1 1230456
```

```
1 654321
```

do while

```cpp
#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>

using namespace std;

int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    cin>>a;
    do{
        cout<<a%10;
        a/=10;
    }while(a);
    return 0;
}
```

```
1  0
```

```
1  0
```

Подсчет факториала

```cpp
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int n,i=1,res=1;
    cin>>n;
    while(i<=n){
        res*=i;
        i++;
    }
    cout<<res;
    return 0;
}
```

```
1  5
```

```
1  120
```

for

```cpp
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int n,res=1;
    cin>>n;
    for (int i=1;i<=n;++i){
        res*=i;
    }
    cout<<res;
    return 0;
}
```

```
1  5
```

```
1  120
```

Чтение произвольного числа символов

```
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    while (cin>>a)cout<<a<<" ";
    return 0;
}
```

```
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    int a;
    for (cin>>a;a;cin>>a)cout<<a<<" ";
    return 0;
}
```

Несколько операндов в for

```
int main(int argc, char const *argv[])
{
    ifstream cin("003in.txt");
    ofstream cout("005out.txt");
    for (int i=0,j=1;i<16;++i,++j){
        cout<<i<<" ";
        if(!(j%4))cout<<endl;
    }
    return 0;
}
```

```
1   0 1 2 3
2   4 5 6 7
3   8 9 10 11
4   12 13 14 15
5
```